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ABSTRACT

The New Standards Project is a partnership of 17 states and 6 major school districts that have joined to develop alternative approaches to setting educational standards and assessing student achievement. In the New Standards Project plan, formal standard setting occurs through a process of public examination of student work products on pilot assessment tasks. This progress report describes the work on task development during the first project year, and outlines plans for pilot studies and grading exercises that will occur in the spring and summer of 1992. At that time, New Standards Project will conduct a pilot of fourth-grade performance assessments in mathematics and English/language arts. A total of 460 teachers in 23 states and over 10,000 students are expected to participate. The design of the pilot is described, and research questions are discussed. Task production for this pilot began at a workshop in 1991 where approximately 450 participants focused on developing authentic tasks. Editing and revising has occurred, with several levels of review. The development of scoring rubrics is the next step, scheduled for April and May 1992. Appendix 1 contains the 11-item teacher questionnaire for the pre-pilot assessment. Appendix 2 lists the steps in task revision as an iterative process. (SLD)

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National Center for Research on
Evaluation, Standards, and Student Testing

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Project 2.1: Alternative Approaches to Assessment
in Mathematics and Science

Alternative Approaches to Assessment in Mathematical Problem Solving

Report on New Standards Tasks and Protocols for Piloting

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REPORT ON NEW STANDARDS TASKS AND PROTOCOLS FOR PILOTING

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The New Standards Project is a partnership of 17 states and 6 major school districts that have joined together to develop alternative approaches to setting education standards and assessing student achievement. In the New Standards plan, formal standard setting occurs through a process of public examination of student work products on pilot assessment tasks. During the first year of work, CRESST funding has partly supported development of the tasks that will be used in the standard setting process. This progress report describes the work on task development during that period and outlines plans for pilot studies and grading exercises that will occur in spring and summer of 1992.

Introduction

This spring, New Standards will conduct a pilot of fourth-grade performance assessments in mathematics and English/language arts. A total of 460 teachers in 23 partner states and districts are expected to participate. Half will be mathematics teachers and half will be responsible for language arts. Each teacher will bring to the pilot a classroom of 20 to 35 students. Thus, data will be gathered on the student-task interaction of more than 10,000 students.

The first section of this report deals with the design of the pilot, from the standpoint of the research questions that it intends to answer. How will these tasks interact with different kinds of students in different states and districts, and what will be the relationship of those interactions one to another? Bias, validity and reliability in multiple contexts must be a central concern, along with very practical questions of time, cost, and classroom effects. We would

like to indicate in this report how some of those concerns are being articulated in our research design.

A second section of this report focuses on the production process in task development. This pilot has required the generation, revision and pre-piloting of many tasks in mathematics and English/language arts. It is an iterative and time-consuming process that should be monitored carefully. If we can learn how to help teachers generate and revise high quality tasks and learn to score them reliably, we will have made a major contribution to the efforts of America 2000 to establish world-class standards in American classrooms. Success in this effort promises not only to raise the standard for what young people are expected to learn, but also to help teachers to help their students reach those goals. In that section of the report, we will review what we have learned thus far about the process of production.

Design of the Pilot

Broad Features of the Tasks and Pilot

The language arts and mathematics assessments will each require three to five 45-minute class periods for administration. The language arts assessments are integrated and are conceived as a literacy assessment. They engage the fourth graders in reading, writing, listening and speaking, and include group activities as well as individual responses. Five to ten sets of tasks (assessments) will be administered in language arts, the number dependent on the results of the pre-piloting currently in progress. Some tasks will be revised and others may be eliminated.

The mathematics assessments will consist of a shorter task that can be completed in one class period and a longer investigation, generally involving some group activity, but yielding individual scores. The tasks tap many dimensions of mathematical power and reasoning. We expect that there will be up to 10 different combinations of short and long questions for the May pilot, depending on the results of the pre-piloting now going on.

The assessment design model is being developed in consultation with CRESST Co-director Robert Linn and is intended to further our research agenda. Many of the questions that drive our research are also central questions for the California Assessment Program (CAP) and performance

assessment developers across the country. Technical advisors to the CAP have been asked to review our research questions and the strategies we propose to respond to those questions.

Research Questions and Approach

Our research agenda was described in a memo this month to California's technical advisory committee, and we adapt freely from that memo. It listed seven major research questions and the ways in which we are responding to them. The responses incorporate many of Robert Linn's suggestions.

Question #1: What are the characteristics of tasks that both yield reliable estimates of student capabilities and display clear targets for student learning effort?

New Standards plan:

- Seek analyses from subject matter experts of the characteristics of the tasks, independent of the data that are collected showing inter-rater or inter-task generalizability;
- Use teacher questionnaires and perhaps structured interviews with a sample of pilot teachers;
- Solicit student reports about their reactions to the tasks.

Question #2: What are various ways of solving the problem of inter-task generalizability in performance exams?

New Standards plan:

- Administer more than one form to a sufficiently large sample of students in an adequately structured design.
- The characterization of tasks in terms of performance demands and the assumed instructional background of students should help provide a means of distinguishing between situations where there is greater or lesser generalizability.

Question #3: What is the optimal mix of assessment tasks of different lengths and characteristics in the exam?

New Standards plan:

- Administer tasks of different lengths and characteristics in the same assessment.
- Obtain sufficient amounts of data from the administration of more than one form to a sample of students. Evaluate trade-offs between designs that involve different amounts of time spent on shorter and longer tasks with different characteristics.
- Have subject matter experts and perhaps cognitive scientists analyze the tasks to characterize them in various ways, for example, content, process demands, prior knowledge required, resource use, reading demands, amount of writing required.

Question #4: What are the possibilities for using a menu of tasks to allow for diversity and student choice within the core exams?

New Standards Plan:

- Use a mix of required and optional tasks, and of exercises within tasks. It is difficult to know whether apparent differences in scores that may be assigned are due to differences in the tasks or in the accomplishments of the students who choose different tasks, or to the rating schemes used for the different tasks. The use of a mix of required and optional tasks provides some handle on this.

Question #5: How do different approaches to grading (e.g., holistic versus analytic scoring) affect inter-grader reliability?

New Standards Plan:

- Have at least some of the tasks scored in more than one way to make the comparison. For both kinds of scores there will be a need to have independent ratings from at least two raters for a subset of the tasks.
- Compare central scoring with local scoring, using a common rating procedure. Previously recorded scores on student responses will not be visible. Training materials will be developed and training sessions held for participating lead teachers. Trained lead teachers will lead scoring tables at a local and regional level.

Question #6: What is the possible role of matrix sampling in an individually focused assessment system—in broadening the assessment focus,

in providing additional information for validating teacher judgments and in calibrating the components of the exam to one another?

New Standards plan:

- Work getting underway for CAP should be helpful in laying out some of the options and in evaluating them. Follow this work closely and incorporate productive strategies in future assessment designs.

Question #7: What are effective methods for establishing comparability between different examinations administered at the same point in time and across time?

New Standards Plan:

- We are currently reviewing with Robert Linn three models of assessment design. The first involves administration of pairs of exams to a common set of students. The second involves administration of different exams to randomly equivalent groups. A third involves use of a common anchor task (or tasks). Our plan is to adapt the first model to a 10% sample drawn from our 23 partner jurisdictions, using at least five assessment task sets in each subject area.

Production of Tasks

Our task production began July 29-August 4, 1991, at a standards development workshop in Snowmass, Colorado. Teachers and curriculum supervisors came from our partners: 21 states and 6 independently affiliated urban districts. All of the New Standards Project states, with the exception of Iowa, were able to attend. Partner states present were: Arizona, Arkansas, California, Colorado, Connecticut, Delaware, Kentucky, Maine, New York, Oregon, South Carolina, Texas, Vermont, Virginia, and Washington. Partner districts in attendance were: New York City Schools, Pittsburgh Public Schools, San Diego Unified School District, Fort Worth Independent School District, Rochester City Schools, and White Plains City Schools.

Of the approximately 450 participants, teachers of mathematics and English/language arts teachers were the largest single constituency. Although the program included panels and speakers, the focus was on the development of performance tasks in mathematics and English/language arts. The goal was to begin with classroom teachers the construction of assessments

that could serve as desirable models of tasks in a national system of examinations. At the same time, and in tandem, we wanted to develop tasks that could serve the assessment, professional development, and curriculum needs of the partner states and districts. In November, the New Standards governing board authorized us to proceed with a pilot of fourth-grade performance assessments in mathematics and language arts in all of our partner states and districts.

The Task Development Process at Snowmass

Some materials were distributed to participants in advance of the meeting. Other items were added on site. The collection included an analysis of the standard setting process, guidelines for task development, framework documents for the subject areas, sample performance tasks, and research papers on technical issues in assessment and task development.

Curriculum frameworks were an essential element in guiding the task production process. Where a clear and focused framework had been developed and consensually agreed to, participants had guidance on what young people should know and be able to do. The existence of such a framework might be referred to only as a point of reference or in terms of schematics, but its presence liberated participants from the burden of trying to convince others what was important in their field. There was still a good deal of discussion and argument about how the content goals should be reached, and whether particular tasks did, in fact, engage those goals, but the debate was not about what to do and whether to do it. The debate focused on *how*. Mathematics teachers at the conference, familiar with the *NCTM Standards* (and also presented in Snowmass with copies of the two volumes), were in the favored group.[1]

In English/language arts, the NAEP reading framework and an exemplary state framework provided a point of departure for group discussion. An effort was also made to focus discussion on literacy issues broadly conceived. Fundamental disagreements were unresolved, however. Was it all right to assess writing without reading? Could reading be assessed without

[1] A decision was made by the Mathematics Advisory Committee in January, 1992 to provide teachers participating in the spring pilot with the new *California Mathematics Framework* as a complement to the *Standards* and as a contribution in its own right to thinking about mathematics and mathematics assessment.

writing? Did listening and speaking belong in an assessment? Was broad-based literacy development an appropriate goal for the schools? What did it mean? How could the goal be advanced? When the English/language arts teachers sat down to develop tasks, they were handicapped by the lack of consensus on these issues in their field. This was true despite the experience over more than a decade with open-ended writing in large-scale assessments.

During the week, approximately 20 hours were devoted to the development of authentic tasks, designed to engage student interest and call for higher-order and integrative understanding. For task development, participants were divided into cross-state groups of approximately 10 people. Often, these groups further divided by grade level and interest. Both groups were amply provided with guidelines for the preparation of tasks, but only the mathematics teachers could be shown prototype tasks which clearly addressed a consensual framework. Excellent material on the process of task construction was provided by Grant Wiggins, Doug Clarke and Linda Wilson from the University of Wisconsin-Madison, and the Connecticut Common Core of Learning Assessment Project. Readings gave suggestions for the process. They included group brain-storming of ideas and ways to test those ideas for content and context.

Developers were asked to consider what a teacher would need to know to administer the task, where the task fit in the curriculum, what materials and equipment would be needed, what kinds of assistance the teacher should be prepared to provide, etc. Equity and appropriateness bounded these considerations. Review by colleagues and student tryouts, followed by revision and further tryouts, were all described as part of the process.

Workshop participants generated a total of 156 performance tasks—53 in the field of literacy and 104 in the field of mathematics. The lag in content framework development was a major contributor to the slower pace at which the English/language arts developers were able to work. The same number of developers drafted half as many tasks. The tasks that were produced, moreover, did not often lend themselves to administration during even a single week of class time. Two-thirds of the tasks took more than two weeks to carry out and belonged in the category of projects or substantial sections of portfolios. Many were quite imaginative, but not well-suited to meeting the goal we were formally assigned by our governing board in November of preparing a fourth-

grade performance assessment for piloting the following spring. In mathematics quite the opposite was true. Eighty-seven of the mathematics tasks produced at the workshop were designed as single-day assessments, although it turned out that several might require more time.

The quality of the mathematical topics of the tasks varied from exploring number theory, algorithms, geometric properties and other pure mathematics to investigations of real-life situations. In examining the most promising of the fourth-grade tasks, we found that many of the *K-4 NCTM Content Standards* were adequately sampled, but that of these, Connections, Number Sense and Numeration, Concepts of Whole Number Operations, Fractions and Decimals, and Patterns and Relations had the thinnest coverage. The tasks addressed varied content areas, with many requiring students to gather data on a topic, to explore it, and to make and explain conclusions that could be drawn from the results. Almost all of the tasks required written descriptions of the results, letters describing and supporting conclusions, or reports of other kinds, with appropriate charts, graphs and diagrams.

Establishing an Interim English/Language Arts Framework and Prototype Assessments

The challenge faced by subject area advisory groups in the two fields, after Snowmass, was in some ways quite different. For the English/language arts group, the special challenge was to develop an interim framework to guide task development and to come up with some prototype assessments in harmony with the framework. Our staff and a 25-member advisory group have been working toward this end. Staff, with members of the advisory group, reviewed the state framework documents to identify areas of emerging agreement about the way in which literacy ought to be defined and encouraged. After this review, our staff presented an interim draft framework to the group in January, and it is scheduled for discussion again at a meeting to be held in March.

Project staff members have also been working with members of the advisory committee, subject area specialists in our partner states and districts, and teachers (in workshop settings) to generate tasks that can be administered within three to five class periods and that offer an integrated view of literacy achievement. Four English/language arts assessment tasks of this kind were

presented to a meeting of site coordinators and lead teachers from our partner states and districts in February, for approval and pre-pilot assignment. Others have since been distributed for pre-piloting.

There now seems to be broad agreement among our advisory group and our partners that an integrated literacy assessment is desirable and feasible. This is a major step forward. There is general agreement, too, that we need to broaden the range of texts used in our assessments—toward science and history/social studies, moving across the disciplines, and toward more non-literary dimensions of literacy. There are disagreements about a host of issues: the wording of questions, whether reading is being adequately and appropriately tapped, whether the group pre-reading and pre-writing activities will be effective, and whether final drafts add or subtract from the quality of what fourth graders will write. Many of these questions will be resolved by the teacher and student responses to the pre-pilot tasks. (See Appendix 1 for the Pre-Pilot Teacher Response Form.)

Editing and Revising Tasks

The revision of tasks has been a central priority for both the English/language arts and mathematics advisory groups. It is extremely rare for the form and content of a task generated in a workshop setting, even by experts, to be without flaws. Literacy tasks, in the absence of a fully developed consensual framework for the field, face an especially difficult environment. Some of the integrated literacy tasks have undergone considerable revision even before prepiloting. We have kept a history of the revision process for some of them, from generation by teachers and curriculum supervisors in a workshop setting (with only the text passage provided by staff), to a second stage of revision by staff and consultants, to yet a third rendering by lead teachers and subject area experts, all before pre-piloting. Appendix 2, *Task Revision as an Iterative Process,* charts changes for one task. We will continue to log the changes proposed for this and other tasks, in English/language arts and mathematics, and provide some analysis of the meaning of these changes.

In mathematics, staff members, working with Diane Briars (Pittsburgh Public Schools and NCTM), sorted and examined the tasks produced at Snowmass, focusing on those produced for the fourth grade. Sixteen of those math tasks were selected for further revision. The process of revision,

accompanied by some new task generation, began in early January in a workshop led by Bonnie Hole of the Connecticut Department of Education. The product of their efforts was presented to the Mathematics Advisory Committee, which met in San Francisco at the end of January.

At this meeting, the sample tasks were discussed in detail. Special attention was paid to the social and cultural contexts suggested by the mathematical problems. The goal was not simply to eliminate bias, but to recognize undesirable hidden messages that might emerge through the text. Some members of the advisory committee rewrote some of these items and provided new items in areas where the content coverage was weak. The tasks were then sent out again to the full committee for comment and editing. Plans were made for varying the ways in which some of the items would be presented to students in the pre-pilot. The student and teacher responses to the pre-pilot tasks will be reviewed in March and April.

Before the mathematics advisory committee makes its final recommendations for the May pilot, the Mathematical Sciences Education Board will review the tasks, paying particular attention to mathematical content, pedagogy and appropriate developmental level. Those tasks that still require revision or otherwise raise questions will be identified before the piloting. The desirability of multiple levels of review is unquestioned within the New Standards Project. The informative discussion that has been part of every review of tasks has confirmed our respect for task development and review as an important aspect of standard-setting.

Plans for Grading the Pilot Assessments

This report has focused on design of the pilot and production of tasks. The next step will be the development of scoring rubrics. The development of scoring protocols will take place in April and May, after our working groups of subject area advisors and lead teachers have reviewed student responses to the pre-piloted tasks. The working groups will have an opportunity to review several different proposals for scoring rubrics appropriate to the tasks, reflecting the practices of our partners, other states, and experimental programs working in different parts of the country.

After decisions are reached, scoring packets with benchmark papers for the tasks will be produced. They will be used at the scoring workshop, June 26-30, held for lead teachers and site coordinators from all New Standards partner states and districts. Teachers will be trained there to score the tasks piloted in the spring assessment and to lead scoring workshops for other pilot teachers in their own districts. Some of our partners have already scheduled such workshops in the first three weeks of July, as part of their staff development programs.

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Appendix 1

Teacher Responses to Pre-Pilot Assessment

NEW STANDARDS PROJECT
Teacher Response to Pre-Pilot Assessment

Your comments and suggestions will be very helpful as we continue to develop materials for student assessment. We would appreciate your response to the following questions, and invite you to offer extended comments if you wish. Please return this questionnaire by Federal Express at our expense, using the directions at the end of the survey. Thank you for participating in this important project.

Your Name: _____

School Name, Address, and Phone: _____

_____

_____

Name(s) of Task(s) Administered to Your Class: _____

_____

_____

Dates Administered: _____ Number of Students Participating: _____

(1) To what extent were students engaged by this assessment? (Circle One)

Not Engaged		Somewhat Engaged		Very Engaged
1	2	3	4	5

(2) To what extent do the activities that were part of the assessment reflect the kinds of things that you do in your classroom? (Circle One)

Not Similar		Somewhat Similar		Very Similar
1	2	3	4	5

(3) Were the directions clear enough for both teachers and students to understand? How might they be improved?

(4) Was the level of difficulty appropriate for your students? What items were too difficult or too easy?

(5) Did students have enough time to respond? Are there sections of the assessment that require more or less time?

(6) On what aspects of the tasks did your students do especially well? On which aspects did they not do so well?

(7) Were the materials attractively presented? What changes would you suggest in the physical design or layout of the materials?

(8) Overall, what did you like and dislike about this assessment?

(9) Are there any ways, not already mentioned, in which you would change this assessment to make it more effective?

(10) If this pilot assessment has suggested other texts, themes, or types of questions you would like to see developed in fourth-grade assessments, please share your ideas with us.

(11) Do you have any other comments, questions, or suggestions concerning these tasks, or the assessment project in general?

Directions for Returning Materials

Please divide your student response sheets or booklets into three groups labelled "High," "Medium," and "Low," reflecting your general estimate of the quality of the students' work. Place each group in a separate envelope marked "High," "Medium," or "Low," and indicate the number of student responses in each envelope. Then please return all assessment materials (readings, student responses, instructions, etc.) to New Standards by Federal Express at our expense. Use our number (0152-0291-2) in the space marked "Federal Express Account Number," and add the "Internal Billing Reference Number" (5-37326-421) in the appropriate space. Send the materials by Standard Overnight service to New Standards Project, LRDC Room 408, 3939 O'Hara Street, Pittsburgh, PA 15260. Call us at (412) 624-8319 if you have any questions.

Thank you once again for participating in this project, and for taking the time to share your comments with us.

Appendix 2

Task Revision as an Iterative Process

Task Revision as an Iterative Process: "Camels" as a Case Study

Stage 1	Stage 2	Stage 3
Task as it emerged from a district workshop	**Task as revised by staff and consultants**	**Task as revised by lead teachers and subject area experts**
Day 1—Reading	**Day 1—Reading**	**Day 1—Reading**
Students are asked to read the article "Ships of the Desert" and answer the following questions about it:	Students are asked to read the article "Ships of the Desert" and answer the following questions about it:	Students are told to imagine that they are working as a zookeeper at a zoo that will be getting a new camel. They are asked to read the article "Ships of the Desert" and answer the following questions about it:
1. Make a list of four amazing or interesting things that you discovered about camels.	1. List four interesting facts that you learned about camels from the article.	1. Use words, pictures, or both, to show the interesting or important thing that you learned about camels from this article.
2. Why did the author write the article? Write three or four sentences to explain.	2. Why might the author have written this article? Explain in three or four sentences.	2. Imagine that you are a zookeeper. Explain why the information that you learned about camels is important for you to know.
3. How does the author want you to feel about camels? Use three or four sentences or phrases from the text to explain your answer.	3. Do you think that camels are good animals to work with? Use at least one example from the article to explain your answer.	3. There are different types of camels, but all camels are alike in some way. Use this chart show what you learned about all camels and what you learned about different kinds of camels.
	4. What are two characteristics of the camel that help it to survive in its environment? Explain how each of these characteristics helps the camel to survive.	4. When people come to visit an animal at the zoo they will see a sign that tells them about the animal and how to behave around it. Write a sign for the new camel at your zoo. The sign should be short, interesting, and easy for people to read.
	5. Think of another title for the article and write it on the lines below. Does your title better describe what the article is about than the author's? Explain which title you think is better and why.	5. You are planning to write a letter to the zookeeper who used to care for the camel. What do you still need to know if you are going to take good care of this camel?

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Stage 1	Stage 2	Stage 3
Task as it emerged from a district workshop	**Task as revised by staff and consultants**	**Task as revised by lead teachers and subject area experts**
Day 2—Discussion/Prewriting	**Day 2—Discussion/Drafting**	**Day 2—Prewriting/Discussion**
1. Students share facts on camels in small groups.	1. In small groups, each student describes an animal in terms of its appearance, usefulness, environment. The student does not reveal the name of the animal. Others in the group try to guess what the animal is.	1. Students complete a list or cluster diagram on important ideas about camels.
2. Students complete a graphic organizer that compares and contrasts different types of camels.	2. Students begin first drafts on one of the following topics:	2. Students meet in small groups to discuss the following questions:
3. Students discuss in small groups characteristics of the camel that make it better able to live in its environment than humans.	• Imagine that you are visiting another planet that has different animals than our own. Write an entry in your travel journal about one of the animals that you have seen. Describe the animal as completely as the camels are described in the article you read. After you finish writing you may draw a picture of the animal if you wish.	• What is interesting or special about camels? • What different kinds of camels should people know about? • How do camels survive?
	• The zoo in your town is thinking about adding a camel to its collection. Write a letter to the manager of the zoo persuading her to buy or not buy the camel.	3. Students listen to the teacher read sample zoo brochures aloud. They then meet in small groups to discuss:
	• A family from another state is moving into your neighborhood. One of the children in the family has heard that you are his age and has written a letter asking how he and his family can prepare for their new environment. Write a letter to your future classmate describing your school and community and what he and his family will need in order to get along there.	• Would this writing make me want to visit the zoo? How did the brochure make me curious?
		4. Students examine other zoo brochures and take notes on how they might write a brochure about a camel.

Stage 1	Stage 2	Stage 3
Task as it emerged from a district workshop	**Task as revised by staff and consultants**	**Task as revised by lead teachers and subject area experts**
Day 3—Writing	**Day 3—Revising**	**Day 3—Writing**
Students are asked to write on one of the following topics: • Create an imaginary animal. Write a story, article, or paragraph about your animal. Be sure to describe your animal as completely as the camel is described in the article you read. Draw a picture of your animal if you wish. • Pretend that you are a camel. Write a story about yourself. • Nature has given the camel what it needs to get along in its environment. Write a story or article in which you explain what nature has given you to get along in your environment.	Students use a writing checklist to review their writing from the previous day. They then meet in small groups to gather peer feedback about their drafts. The remaining time is spent revising their writing from the previous day. Topics are listed below: • Imagine that you are visiting another planet that has different animals than your own. Write an entry in your travel journal about one of the animals you have seen. Describe the animal as completely as the camels are described in the article you read. After you finish writing you may draw a picture of the animal if you wish. • The zoo in you town is thinking abut adding a camel to its collection. Write a letter to the manager of the zoo persuading her to buy or not buy the camel. • A family from another state is moving into your neighborhood. One of the children in the family has heard that you are his age and has written a letter asking how he and his family can prepare for their new environment. Write a letter to your future classmate describing your school and community and what he and his family will need in order to get along there.	Students are asked to write a zoo brochure on camels. The exact prompt is show below: • Look back at the notes you made about camels in your response booklet. Using the information from your notes and the article, write a brochure about the new camel that is coming to the zoo. Remember, your brochure should make people curious enough to come and visit the zoo. You may include illustrations if you wish. When you have finished writing, ask yourself these questions: • Will the visitors to the zoo understand what I have written? • Will the brochure be interesting and make the readers curious? • Are my words clearly written so that they can be easily read?